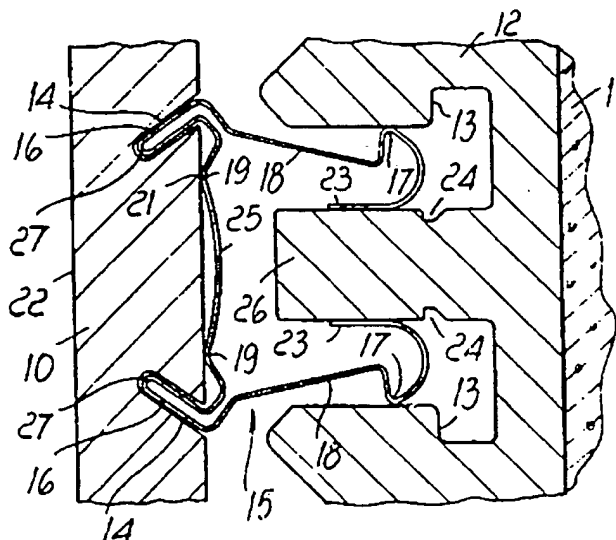




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| (21) International Application Number: PCT/EP94/00375 (22) International Filing Date: 10 February 1994 (10.02.94) (30) Priority Data: MI93A000364 25 February 1993 (25.02.93) IT (71)(72) Applicant and Inventor: BELTRAMI, Pietro, Antonio [IT/IT]: Via Ghevio, 4, I-28041 Aroca (IT). (74) Agent: FORATTINI, A.; Internazionale Brevetti Ingg. Zini Maranesi & C. s.r.l., Piazza Castello, 1, I-20121 Milano (IT). | | (81) Designated States: AU, BB, BG, BR, BY, CA, CZ, FI, HU, JP, KP, KR, KZ, LK, MG, MN, MW, NO, NZ, PL, RO, RU, SD, SK, UA, US, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report. | |

(54) Title: DEVICE AND METHOD FOR FIXING A PLATE TO A BUILDING



(57) Abstract

Device for anchoring a plate (10) to a vertical wall including: a horizontal profile (12) which can be fastened to the wall; a first pair of plate supporting abutments (13) formed in the horizontal profile (12); a second pair of plate supporting abutments (14) formed in the body of the plate (10); a connecting member (15) to elastically connect in a snap-together manner the plate (10) to the horizontal profile (12). The invention furthermore relates to the assembly method. The invention allows to obtain an excellent aesthetic effect and high reliability.

DEVICE AND METHOD FOR FIXING A PLATE TO A BUILDING

The present invention relates to a device for anchoring a plate to a building and to the anchoring method. More particularly, the field of the present invention relates to a plate made of a stone material which is relatively thin, for example 1.5-2 cm, or made of ceramic material, or glass/crystal, or aluminium, or any other material which can be used to face walls. In particular, plates made of ceramic material are preferred, with respect to stone, because they have a higher mechanical strength and can be thinner.

The plates are used to cover walls on the inside and on the outside of buildings.

Various methods for covering buildings with plates are known; for example, cement mortars are used which however are not suitable for accurate execution of the work and do not offer sufficient reliability as regards safety in the case of very large faces, such as for example those of skyscrapers.

Other methods, disclosed for example in the German patent application No 2827502 and European patent application No 483673, provide for external supporting hooks which allow, in various manners, to fit the plates onto the walls. This system, apart from the aesthetic flaws due to the presence of hooks, has considerable problems if a single plate has to be replaced, because it is necessary

to remove an entire adjacent region of plates until a so-called gutter is reached. Fitting times are also rather long, and complicated operations are required.

5 The Italian patent no. 0216861, Spanish utility model no. 9002802, German patent application no. 1684060, French utility model no 2652132 disclose systems for anchoring plates to walls including grooves formed on the plates so that these grooves can be engaged by a connecting
10 member which connects the plates to horizontal profiles which are fixed to the wall. However, in practice it has been observed that this system is not free from drawbacks, because the plates tend to break under high pressures, for example under the force of wind, which for
15 very tall buildings reaches a speed of 150-200 km/h and produces very high pressure peaks on the plates. Furthermore, the mounting is not accurate enough, since the grooves formed on the plates are not all identical, due for example to the wear of the disk of the tool which
20 produces these grooves, and a proportional misalignment is a direct consequence of this. Furthermore, despite the need to tighten a large number of locking screws, a certain play remains; this play is very dangerous, because it causes an inaccurate alignment and entails a
25 harmful effect in the course of time allowing a "flapping" effect induced by the wind within this play. Furthermore, fitting times are still rather long and complicated operations are still necessary.

30 The aim of the present invention is therefore to overcome

the above drawbacks with a device and a process which allow precise fitting, with an excellent aesthetic effect, while reducing the working time.

- 5 An object of the invention is to avoid play between elements, so as to provide a durable and reliable mounting even in the presence of strong winds.

10 Another object of the invention is to prevent the manual adjusting of parts, such as for example screws, bolts, etc., to achieve the double aim of reducing the working time and of eliminating critical parts that always tend to break and oxidize.

- 15 Another object of the invention is to obtain perfect planarity, independently of the depth of the grooves formed in the plates.

20 Another object is to allow the installation of plates even on inclined walls or on ceilings.

Another object is to allow prefabrication of a wall complete with plates in a factory.

- 25 Another object of the invention is to reduce the depth of the cantilevered part of the connecting member from a length of approximately 20-25 mm to 3-10 mm, thus increasing the overall reliability of the entire system.

30 This aim, these objects and others are achieved by the

device according to the invention for anchoring a plate to a wall or to a ceiling, which includes:

- 5 -- a horizontal profile which can be fastened on the wall;
- a first pair of abutments for supporting the plate, formed in the horizontal profile;
- 10 -- a second pair of abutments for supporting the plate, formed in the body of the plate itself;
- a connecting member to connect the plate to the horizontal profile;
- 15 -- an external part of the connecting member being provided with an external pair of abutments which are complementary and are suitable to engage the second pair of abutments;
- 20 -- an internal part of the connecting member being provided with an internal pair of abutments which are elastically flexible, complementary and suitable to engage the first pair of abutments in a snap-together
- 25 manner; said external pair of abutments and said internal pair of abutments being substantially parallel.

Further characteristics and advantages of the invention will become apparent from the description of two

30 preferred but not exclusive embodiments of the device,

illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a sectional side view of the device according
5 to the invention during assembly;

Figure 2 is a sectional side view of the device of Figure
1 after assembly;

10 Figure 3 is a sectional side view of a second embodiment
of the device according to the invention during assembly;

Figure 4 is a side view of the device of Figure 3 after
assembly;

15

Figure 5 is a perspective view of a detail of the device
of Figure 1;

Figure 6 is a perspective view of a detail of the device
20 of Figure 3;

Figure 7 is a sectional side view of the device according
to a third embodiment of the invention during assembly;

25 Figure 8 is a sectional side view of the device of Figure
7 after assembly;

Figure 9 is a perspective view of a detail of the device
of Figure 7;

30

Figure 10 is a perspective view of a detail of the device according to a fourth embodiment of the invention.

With reference to Figures 1 to 10, the device according to the invention for anchoring a plate 10 to a vertical wall 11 includes a horizontal profile 12 which can be fastened to the wall 11. A first pair of supporting abutments 13 is formed in the horizontal profile and extends horizontally. In particular, the first pair of abutments 13 is arranged on a plane which is substantially parallel to the wall.

A second pair of abutments 14 is formed in the body of the plate 10. The abutments 14 can be obtained either by machining the plate 10 with a rotary-disk tool or, with particular reference to the second preferred embodiment, shown in Figures 3, 4 and 6, directly during the molding of the tile. In this second case, the set of abutments 14 has the so-called dovetail shape.

20

A connecting member, generally designated by the reference numeral 15, connects the plate 10 to the profile 12. In particular, the connecting member 15 has an external part, where "external" designates the part directed toward the plate, and an internal part, where "internal" designates the part directed toward the wall. The external part of the connecting member 15 has an external pair of abutments 16 which are shaped complementarily to the second pair of abutments 14, so as to be able to engage them adequately. The internal part

of the connecting member 15 is provided with an internal pair of abutments 17 which are elastically flexible by virtue of the flexing of the portion 18. The abutments 17 are shaped complementarily to the first pair of abutments 13 and are suitable to engage them with a snap-together action.

Preferably, the external part of the connecting member 15 includes a fifth pair of abutments 19 which is suitable to engage a rear region 21 of the plate 10 which is arranged parallel to an external face 22 of the plate 10. In particular, the rear area 21 of the plate 10 is simply a region which can act as reference so as to maintain the parallel arrangement of the external face 22 of the plate 10.

Preferably, the internal part of the connecting member 15 includes a sixth pair of abutments 23; these abutments are complementary and are suitable to elastically engage, in a snap-together manner, a seventh pair of abutments 24 arranged on the profile 12. The sixth pair of abutments 23 and the seventh pair of abutments 24 act so as to generate a force which is directed so as to prevent disengagement between the first pair of abutments 13 and the internal pair of abutments 17. In particular, the elastic end 23 of the connecting member 15 forms the sixth pair of abutments 23. In this manner, engagement between the first pair of abutments 13 and the internal pair of abutments 17 is ensured, because the end 23 is locked in the seat 23 and prevents the connecting member

from being extracted by forcing.

Preferably, both the external pair of abutments 16 and the internal pair of abutments 17 are formed with a 5 folded part of the connecting member 15. According to a preferred embodiment, the connecting member 15 is formed with a single piece of folded elastic steel with a thickness between 0.3 and 0.6 mm, preferably between 0.35 and 0.55 mm and more preferably between 0.4 and 0.5 mm.

10 Preferably, the connecting member 15 includes a central region 25 which cambers inward toward the wall 11. This central region is suitable to be engaged by an extension 26 of the profile 12 so that the extension 26 can press against the central region 25 so as to elastically deform 15 the central region 25 and change the position of the external pair of abutments 16, so as to improve engagement with the second pair of abutments 14. More preferably the extension 26 of the profile 12 has a concave angular shape, and the recessed central region 25 20 has convex angular shape. The coupling of the concave-convex shapes improves the vertical stability of the plate.

According to the first embodiment, with particular 25 reference to Figures 1, 2, 5, 7-9 the external pair of abutments 16 tapers inward. According to the second preferred embodiment, with particular reference to Figures 3, 4 and 6, the external pair of abutments 16 widens outward. Preferably, the length of the connecting 30 member 15, measured horizontally, is between 15 and 50

mm, more preferably between 20 and 40 mm, and even more preferably between 25 and 35 mm.

5 The end 27 of the external pair of abutments 16 can be rounded, so as to reduce shearing pressure on the plate and limit the possibility of breakage.

10 It is provided for that the external abutment pair 16 may yield elastically in the space 28 formed between the connecting member 15 and the profile 12. Similarly, also the internal pair of abutments 17 may elastically yield in the region 29 between the connecting member 15 and the profile 12. This elastic yield allows a certain controlled movement of the plate 10 with respect to wall 15 11. In this manner not only are plays kept under control, but it is possible to reduce the impact of external forces on the various couplings. With respect to the portion 18 of the connecting member 15, the profile 12 acts as a support which vertically supports the 20 connecting member 15 so as to avoid unwanted deformations. In particular, the profile 12 externally supports the connecting member 15 substantially along the entire portion which joins the external pair of abutments 16 with the internal pair of abutments 17. The 25 unsupported portion has a length of approximately 3 mm.

The method according to the invention thus includes the use of a plurality of devices as described above. In a first step, the connecting members 15 are fitted to the 30 plates 10. For this purpose it is sufficient to slide the

abutments 16 laterally inside the abutments 14 until the connecting members 15 are located in the required region of the plates 10.

- 5 Abutments 14 are usually obtained on the sides of plates 10, but may be obtained also on the inner part of the plates 10. In this latter case abutments 14 are dead and the connecting members 15 may be mounted on plates 10, by a manual pressure perpendicular to the ends 23, so as to
10 push one against the other and so as to diverge abutments 16, with particular reference to the embodiment reported on figures 1, 2, 5. When abutments 16 are diverged it is possible to insert them into abutments 14 of the plate. This operation may be impossible with plates having a
15 large thickness and with longer abutments 16. In this latter case, with particular reference to figure 10, each abutment 14 comprises a chamber 30 having a rectangular cross-section which is obtained into the body of the plate. The chamber 30 is large enough to arrange
20 inside abutments 16 which can then slide laterally inside abutments 14. The connecting members 15 can so be placed in any requested position.

- This first step may be performed prior to the time of
25 final installation and in a suitable location, other than the building site. In a second step, the plates thus prepared are fitted by snap-together coupling of the first pair of abutments 13 and of the internal pair of abutments 17. This coupling occurs by simple pressure, so
30 as to force the end 23 to flex and allow the entry of the

connecting member 15 in its seat. Correct insertion can be checked acoustically, since it is possible to clearly hear first of all the snap of the insertion of the internal pair of abutments 17 and then the snap of the sixth pair of abutments 23. Simultaneously, the extension 26 of the profile is located automatically against the recessed part 25 of the connecting member so that by means of the simple operation of pressing to insert the plate all the abutments are placed under tension, to ensure optimum locking. The particular shape of extension 26 and the recessed part 25 of the connecting body 15 is an additional centering means between abutments 14 and the central part of profile 12, so achieving an improved horizontal selfalignment of the upper and lower edges of the mounted plates.

If it is necessary to replace a defective plate in a finished wall, the defective plate can be removed or broken, and then a new plate can be simply inserted by snap-together coupling, without disturbing the surrounding plates.

In practice it has been observed that the invention allows to obtain a very stable anchoring with excellent aesthetic finish, which is shown by an optimum complanarity of the face plane, by the regularity of the vista, i.e. of the spaces between the plates, both horizontally and vertically.

This is automatically achieved by pressure coupling

between the connecting members 15 and the profile 12, so avoiding the need of manual adjustment operations carried out for example by means of screws, squares, silicon sealants, etc.

5

Furthermore it is ensured limitless durability for the damping action of the connecting member 15, especially if suitable materials, such as for example elastic stainless steel for the connecting member 15, are used.

CLAIMS

1. Device for fixing a facing plate (10) to a building characterized in that it comprises: a horizontal profile (12) which can be fastened to said building and which has
5 a first pair of abutments (13) for supporting said plate (10); a second pair of abutments (14) for supporting said plate (10), formed in the body of said plate; a connecting member (15) to connect said plate (10) to said horizontal profile (12); an external part of said
10 connecting member (15) being provided with an external pair of abutments (16) which are complementary and are adapted to engage said second pair (14) of abutments; an internal part of said connecting member (15) being provided with an internal pair of abutments (17) which
15 are elastically flexible, complementary and adapted to engage said first pair of abutments (13) in a snap-together manner; said external pair of abutments (16) and said internal pair of abutments (17) being substantially parallel.

20

2. Device according to claim 1, wherein said external part of said connecting member (15) comprises a fifth pair of abutments (19) adapted to engage a rear area (21) of said plate (10) which is arranged parallel to an
25 external face of said plate (10).

3. Device according to claim 1 and/or 2, wherein said internal part of said connecting member (15) comprises a sixth pair of abutments (23) which are complementary and
30 are suitable to engage, elastically and in a snap-

together manner, a seventh pair of abutments (24) located on said profile (12); said sixth and seventh pairs of abutments generating a force which is directed so as to prevent disengagement between said first (13) and
5 internal (17) abutment pairs.

4. Device according to claim 3, wherein said sixth pair of abutments (23) is formed by the elastic end of said internal part of said connecting member (15).
10

5. Device according to at least one of the preceding claims, wherein said external pair (16) and/or said internal pair (17) of abutments is formed with a folded part of said connecting member (15).
15

6. Device according to at least one of the preceding claims, wherein said external part of said connecting member (15) comprises a recessed central region (25) adapted to be engaged by an extension (26) of said
20 profile (12) so as to elastically deform the position of said external pair of abutments (16) and improve engagement with said second pair of abutments (14).

7. Device according to claim 6 wherein said extension
25 (26) of said profile (12) has a concave angular shape, and said recessed central region (25) has convex angular shape; the coupling of said concave-convex shapes improving the vertical stability.

30 8. Device according to at least one of the preceding

claims, wherein said external pair of abutments (16) widens outward.

9. Device according to at least one of the preceding
5 claims, wherein said external pair of abutments (16) tapers inward.

10. Device according to at least one the preceding
claims, wherein said connecting member (15) is formed
10 from a single piece of folded elastic steel.

11. Device according to claim 10, wherein the thickness
of said steel is comprised between 0.3 and 0.6 mm,
preferably between 0.35 and 0.55 mm, and more preferably
15 between 0.4 and 0.5 mm.

12. Device according to at least one of the preceding
claims, wherein the horizontal length of said connecting
member (15) is comprised between 15 and 50 mm, preferably
20 between 20 and 40 mm, more preferably between 25 and 35
mm.

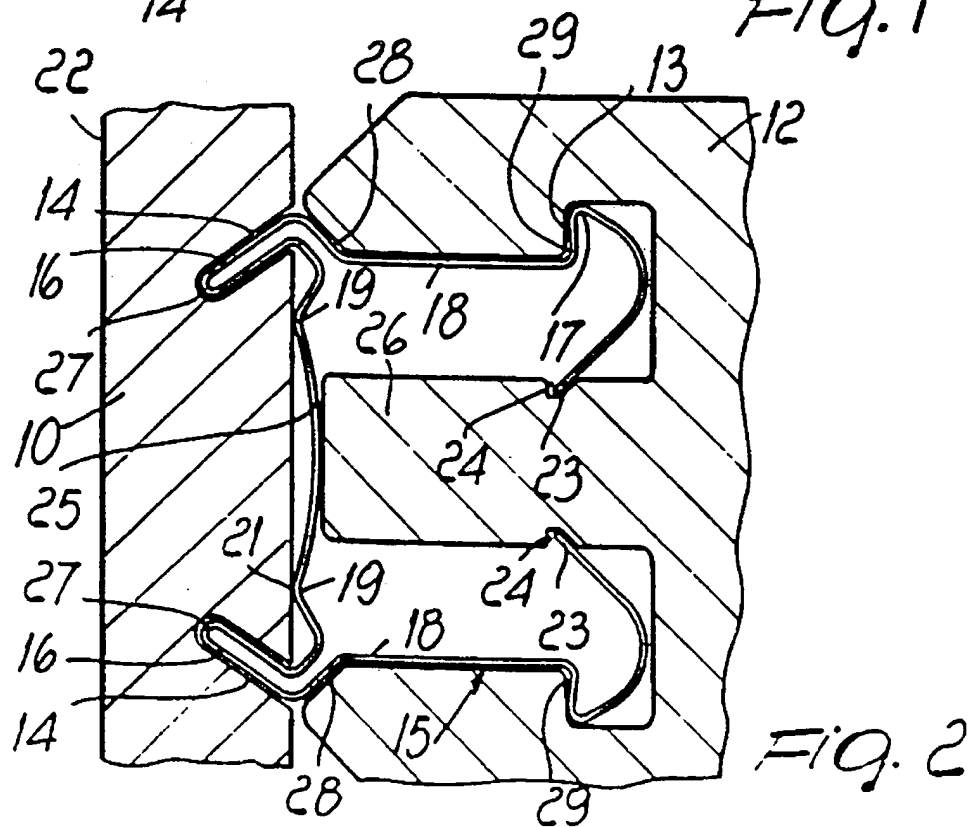
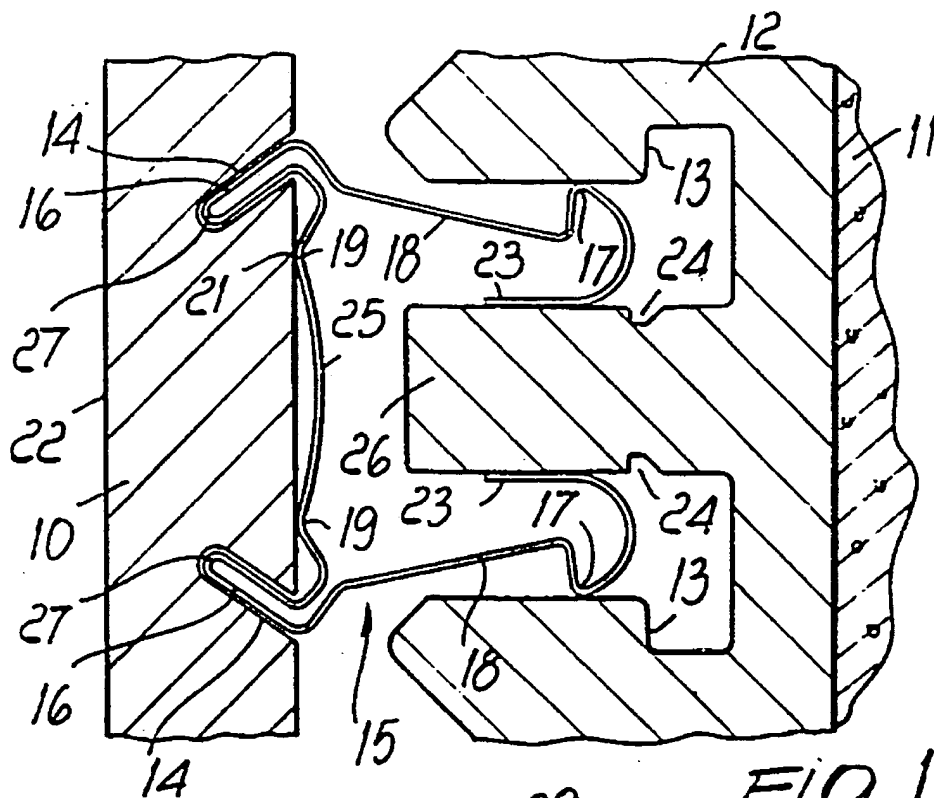
13. Device according to at least one of the preceding
claims, wherein the end of said external pair of
25 abutments (16) is rounded.

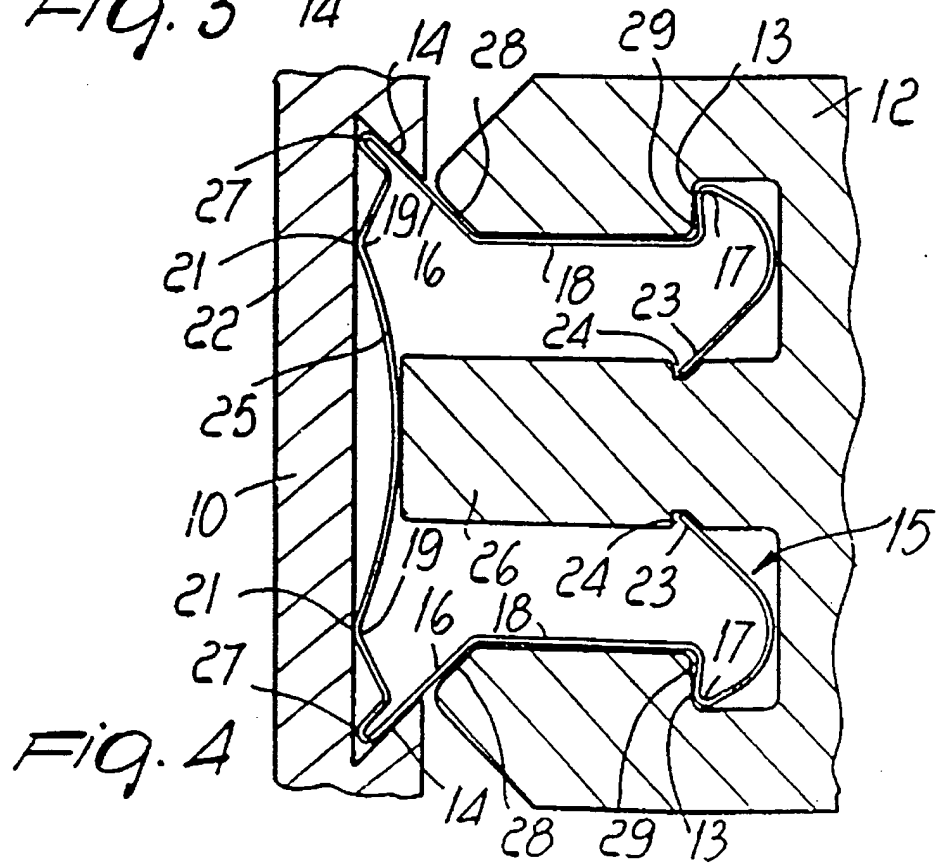
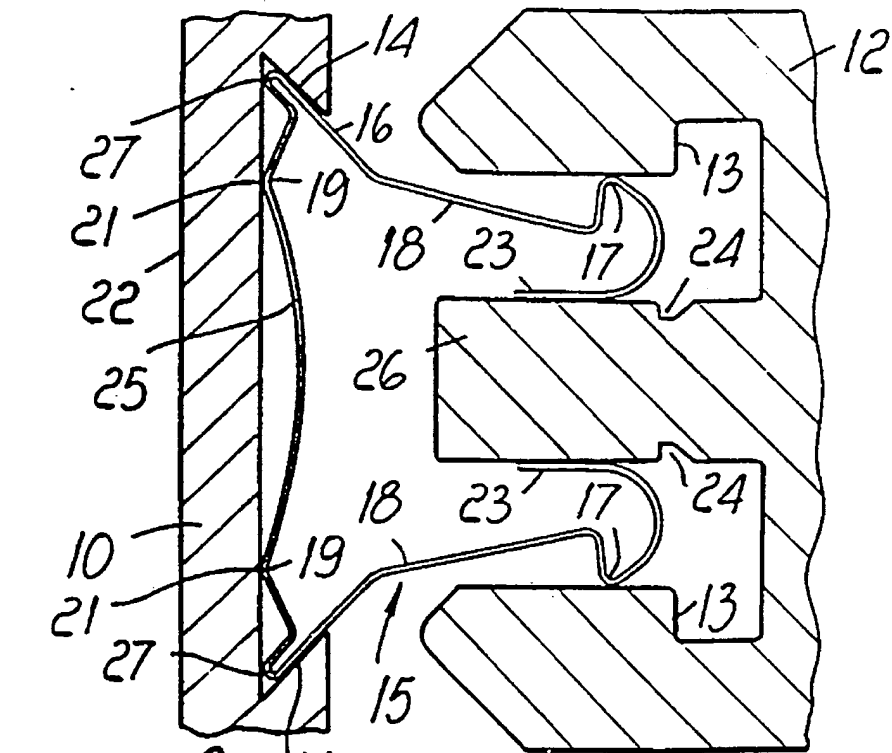
14. Device according to at least one of the preceding
claims, wherein said external (16) and/or internal (17)
pair of abutments allow some give in order to damp
30 external forces and/or to improve centering.

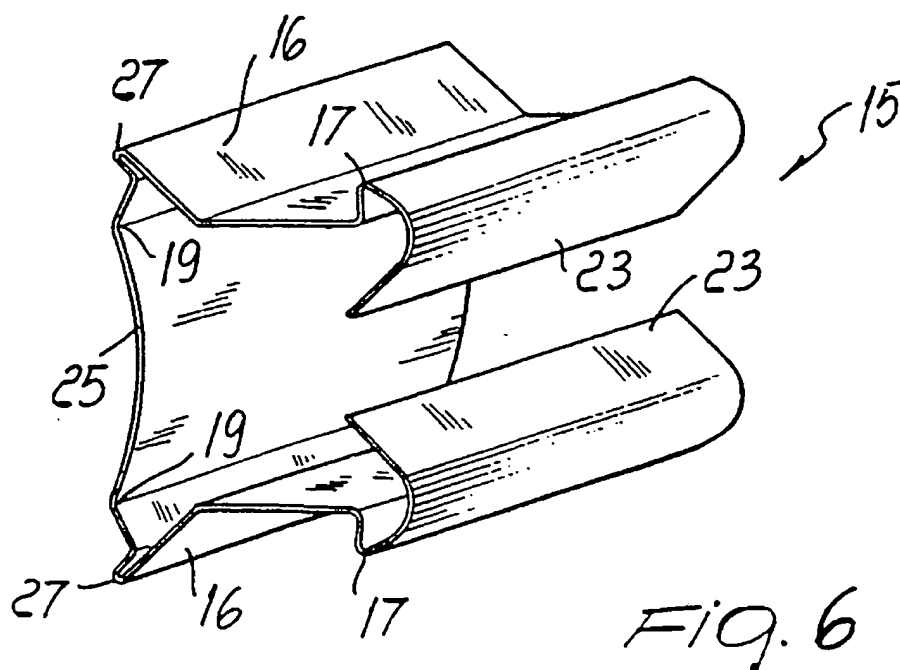
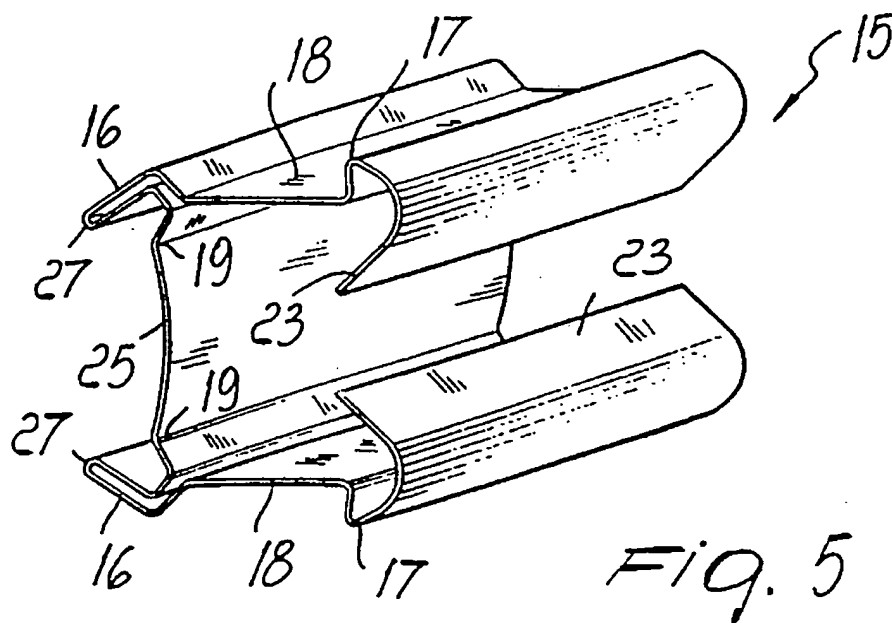
15. Device according to at least one of the preceding claims, wherein said profile (12) externally supports said connecting member (15) substantially along the entire portion which joins said external pair of
5 abutments (16) with said internal pair of abutments (17).

16. Method for the assembly of a wall of plates by using a plurality of devices according to claim 1, comprising: a first step in which said connecting members (15) are
10 fitted on said plates (10); and a second step in which said plates (10) are assembled by snap-together coupling of said first (13) and internal (17) pairs of abutments.

17. Method according to claim 16, for replacing a
15 defective plate (10) in a finished wall, comprising the breakage or removal of said defective plate (10) and the insertion, by snap-together coupling, of a new plate (10) without acting on the surrounding plates.







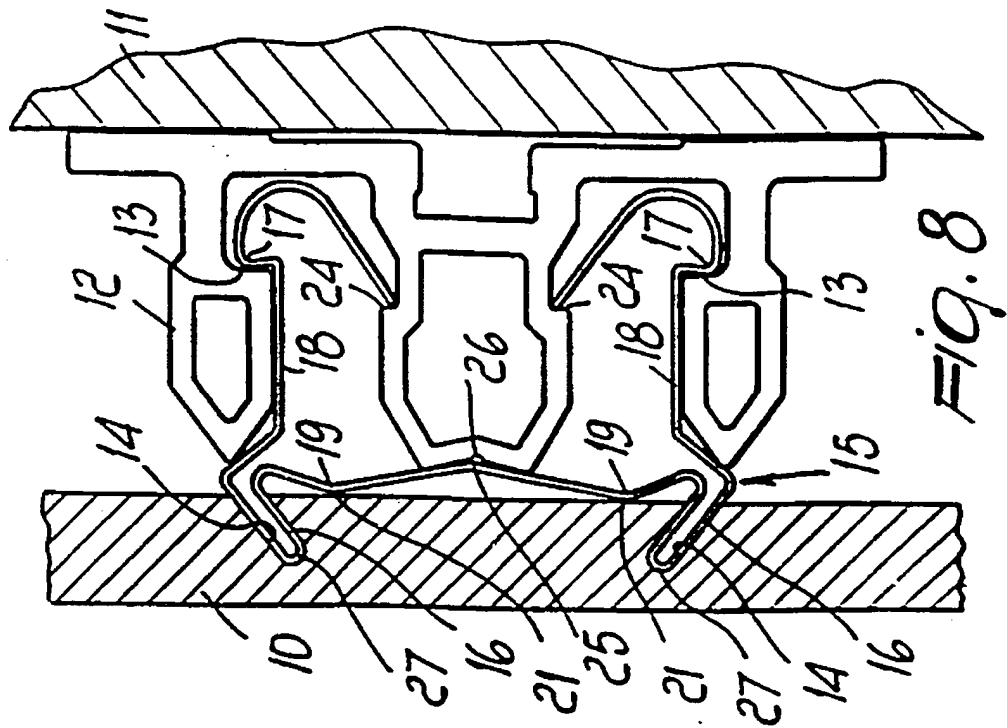


Fig. 7

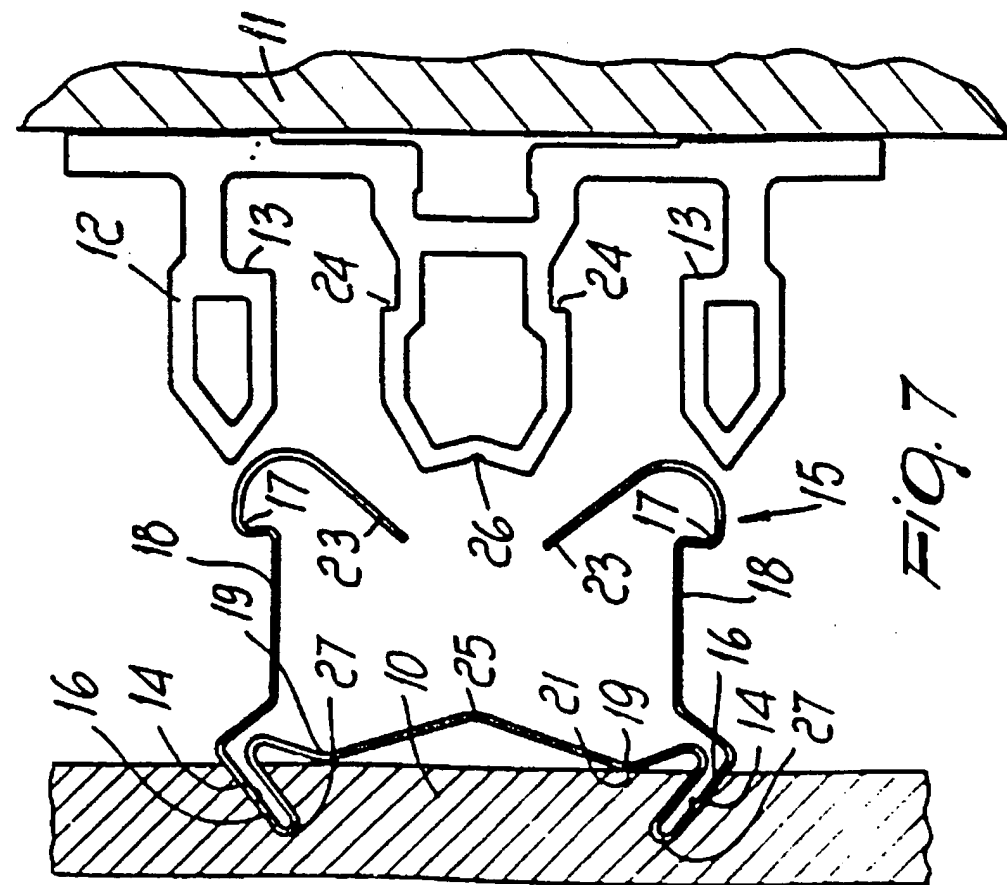
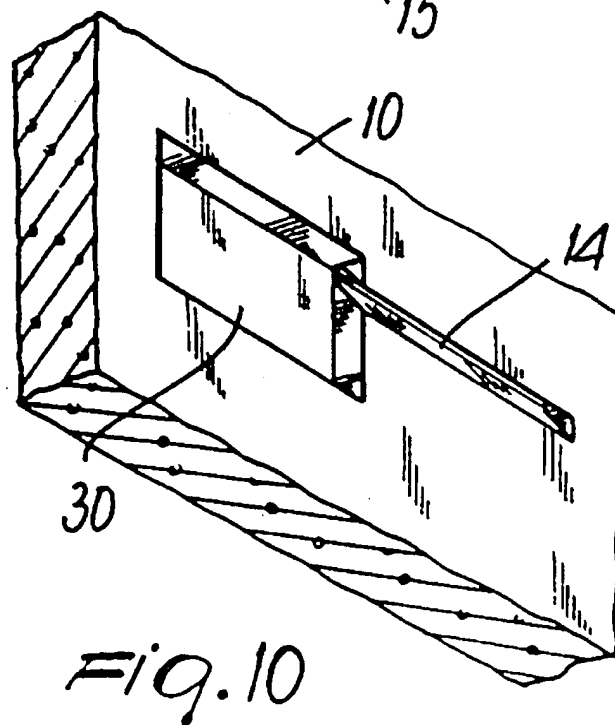
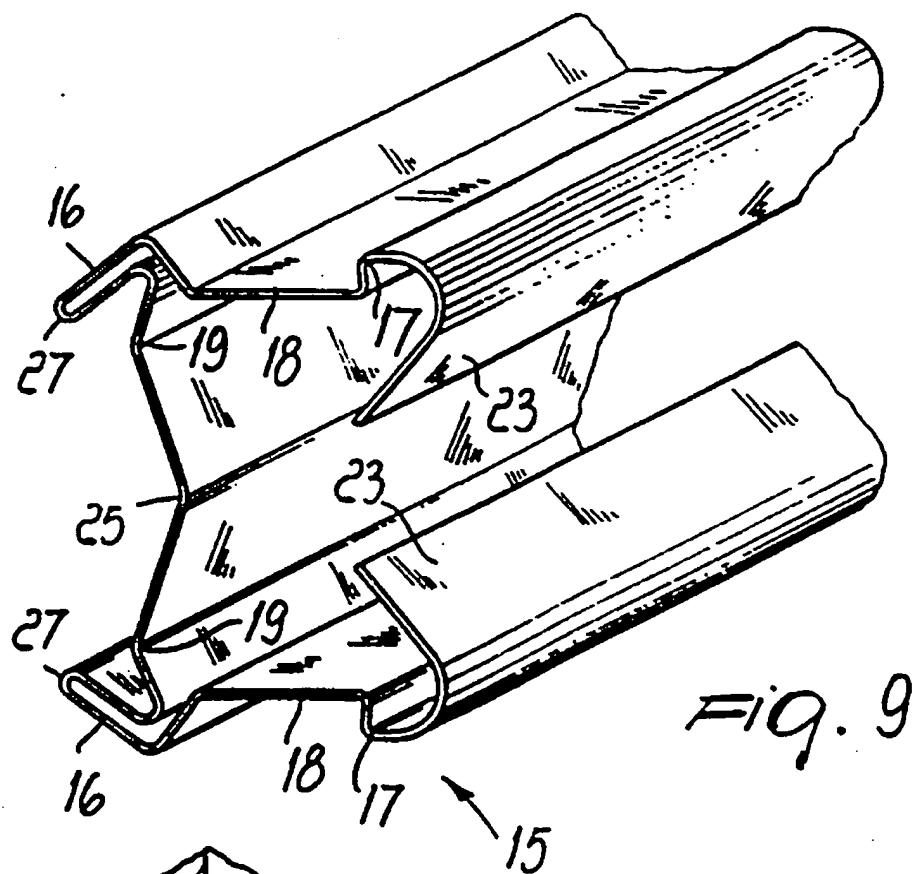


Fig. 8



INTERNATIONAL SEARCH REPORT

Intern. Application No.

PCT/EP 94/00375

CLASSIFICATION OF SUBJECT MATTER
IPC 5 E04F13/08 F16B5/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5 E04F F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| A | DE,A,16 84 060 (FA. FRITZ OSTERLOH) 6 May 1971 cited in the application see page 3, line 26 - page 5, line 14; figures 1-3 ----- | 1,9, 15-17 |
| A | WO,A,89 02960 (MANDELLI) 6 April 1989 see page 3, line 11 - page 6, line 25; figures 1-5 ----- | 1,9,10, 15-17 |
| A | US,A,4 635 424 (DRAPEAU) 13 January 1987 see column 3, line 12 - column 7, line 22; figures 1-7 ----- | 1,9, 15-17 |

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Date of the actual completion of the international search

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Ayiter, J

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 94/00375

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| DE-A-1684060 | 06-05-71 | NONE | |
| WO-A-8902960 | 06-04-89 | NONE | |
| US-A-4635424 | 13-01-87 | NONE | |